APPARATUS AND METHOD OF ASSISTING VISUALLY IMPAIRED PERSONS TO GENERATE GRAPHICAL DATA IN A COMPUTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to techniques for assisting visually impaired persons to generate graphical data in a computer.

2. Description of the Related Art

It is known in the art that with appropriate assistant technology, persons who are blind or visually impaired are able to operate computers, access databases, read printed texts, and so on. By way of example, such technology includes speech synthesis, braille printers, braille displays, dot matrix displays, optical character recognition, etc. It is to be noted that throughout the instant disclosure, terms "blind" and "visual or vision impairment" are interchangeably used. It is to be noted that throughout this application, the term "graph" implies a drawing, figure, etc., including a flowchart, an arrangement for desk-top publishing, and so on.

Speech synthesis is to artificially generate spoken words through the application of computer-based hardware and software, making the computers accessible to persons with vision impairments. Braille printers and displays translate printed text into braille, respectively permitting blind users to obtain hardcopy from computers and to have access to computer screens. Dot matrix displays, which are similar to the braille printers, are usually assembled out of a large number of electromagnetically latching braille-dots. The dot is spring-supported in the "set"-position and held down in the reset position, allowing the users to get a picture of the presented data. On the other hand, optical character recognition systems read the printed word and speak it aloud or transmit the text into personal computers for storage and retrieval.

Thus, the visually impaired persons are able to enter text into computers, using the keyboards, with the aid of speech synthesis, and can get hardcopies of text in braille using the braille printers.

However, it is very advantageous if the persons with vision impairments are allowed to enter graphical data such as flow charts, layouts for desktop publishing, etc. into computers. However, until now no proposal has been made for assisting the blind persons to obtain graphical data in computers.

SUMMARY OF THE INVENTION

It is therefore an object of the present to provide an apparatus for visually impaired persons to generate graphical data in a digital computer.

Another object of the present invention is to provide a method of visually impaired persons to generate graphical data in a digital computer.

In brief, these objects are achieved by techniques wherein in order to assist a visually impaired person to generate digital image data in a computer, a plurality of graph components are provided each of which is tactually recognized by the visually impaired person. A touch graph is generated using the graph components on a plate-like member by the visually impaired person. The touch graph is acquired into a computer using an input interface such as digital still camera. Subsequently, a computer software analyzes the digital image data so as to define each of the graph components and logical relationship between the graph components. The analyzed digital image data is stored in a memory within the computer.

One aspect of the present invention resides in an apparatus for assisting visually impaired persons to generate graphical data in a computer, comprising: a plurality of graph components each of which is tactually recognized by a visually impaired person; a plate-like member on which the graph components are positioned to generate a touch graph; an input interface for acquiring digital image data of the touch graph into a computer; an image data analyzer for analyzing the digital image data so as to define each of the graph components and logical relationship between the graph components; and a memory for storing the analyzed digital image data.

Another aspect of the present invention resides in a method of assisting visually impaired persons to generate graphical data in a computer, comprising the steps of: (a) generating a touch graph using a plurality of graph components on a plate-like member, each of the graph components being tactually recognized by a visually impaired person; (b) acquiring digital image data of the touch graph into a computer; (c) analyzing the digital image data so as to define each of the graph components and logical relationship between the graph components; and (d) a memory for storing the analyzed digital image data.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the present invention will become more clearly appreciated from the following description taken in conjunction with the accompanying drawings in which like elements are denoted by like reference numerals and in which:

FIG. **1** is a diagram schematically showing a plurality of touch graph components and a plate-like member on which the touch graph is generated;

FIG. **2** is a diagram showing a touch graph that takes the form of flow chart in this particular case;

FIG. **3** is a diagram showing another touch graph that is generated for desktop publishing;

FIG. **4** is a diagram schematically showing a manner of acquiring the touch graph of FIG. **2** into a computer through a suitable input interface;

FIG. **5** is a diagram schematically showing a plurality of function blocks for use in generating digital image data representing a touch graph; and

FIG. **6** is a sketch illustrating interactive operations for adding information in connection with a given graph component.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One embodiment of the present invention will be described with reference to FIGS. **1–6**.

FIG. **1** is a block diagram schematically showing some examples of components (generally denoted by numeral **10**) via which persons, who are blind or visually impaired, generate touch graphs on a plate-like member **12**. It should be noted that the components **10** shown in FIG. **1** are exemplary and in fact take various shapes or forms in order to generate a variety of touch graphs for flow charts, desktop publishing, etc.

The components (viz., parts or elements) **10** of FIG. **1** are only four in number and utilized to generate flow charts in